

Extramural Report Series
DETERMINANTS OF SITE OF SERVICE FOR
AMBULATORY SURGERY IN MARYLAND

PREFACE

This report was prepared by the **Project Hope Center for Health Policy Studies** under contract to the Health Care Access and Cost Commission (HCACC). Stephen T. Parente, Ph.D. served as Project Director for this study. Michael Cheng, Ph.D., Julie A. Schoenman, Ph.D., Sheila Franco, M.S., and Jennifer Dunbar, M.H.S participated in the research and preparation of this report. A copy of the Technical Appendices referenced in this report may be obtained on request from the HCACC or may be downloaded from the HCACC Web Site at *www.hcacc.state.md.us*.

The work described in this report has been monitored by HCACC staff to ensure compliance with the contract's technical specifications. Opinions, conclusions, and findings do not necessarily represent the views of the Commission. Comments about this report may be sent to Ben Steffen, Health Care Access and Cost Commission, 4201 Patterson Avenue, Baltimore MD 21215

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EXECUTIVE SUMMARY

Overview

The purpose of this report is to examine the variations in site of service for ambulatory surgery in Maryland. For this analysis, ambulatory surgery is defined as taking place in two locations: a freestanding ambulatory surgery center (ASC) or a hospital outpatient department (OPD). In Maryland, OPD surgery reimbursement to the hospital is regulated through the Health Services Cost Review Commission (HSCRC). This regulation makes Maryland unique from all other states where market conditions prevail. Unlike OPD reimbursement, ASC reimbursement in Maryland is unregulated, with prices determined largely by insurers contracting with freestanding facilities. Some of these freestanding facilities may be owned by a hospital, but they are still reimbursed outside of the regulated OPD surgery market because they are distinct from the hospital facility. Maryland is also somewhat unique in that prior exemptions from Certificate of Need (CON) regulations resulted in a high supply of freestanding ASCs, particularly small, single-specialty facilities.

Recent anecdotal evidence from medical providers and insurers (Washington Post, May 31, 1998) suggests that Maryland's regulated OPD surgery market has provided payers with the incentive to direct patients into ASC settings where reimbursement rates are more favorable. The state's high supply of freestanding ASCs may have also contributed to this movement. There are also reports from providers that—when ambulatory surgery patients who live near Maryland's border need the inpatient back-up provided by the OPD setting—some managed care plans are directing these patients to outpatient facilities in jurisdictions outside of Maryland so that more favorable pricing can be negotiated with the facility.

In order to address the role of regulation and managed care in Maryland's ambulatory surgery market and to test the anecdotal evidence with actual data, we developed an empirical analysis to identify the effect of price and payer on patient-level ambulatory surgery location decisions. Our empirical analysis was guided by reviews of the health care finance literature on ambulatory surgery and by Medicare legislation and program rules for OPD and ASC reimbursement. We also completed an exploratory analysis of the 1995 National Survey of Ambulatory Surgery (NSAS) to compare Maryland's experience with the nation. From this comparison we concluded that there may be significant payer-related variations in ASC utilization that should be addressed in the analysis of Maryland data. In addition, the prior literature suggested that the price of a freestanding ASC relative to a hospital OPD's price would be an important factor to model explicitly.

Analytic Approach

We used the 1996 Maryland Medical Care Data Base (MCDB) to develop a patient-level analysis of the factors affecting ASC versus OPD use. This analysis was completed using a multivariate statistical approach. The conceptual basis for this approach was the perspective of practicing physicians who will choose where to perform a procedure based on their preferences and financial incentives (both from third party payers as well as medical business partners), and on the patient's physiological condition, demographic characteristics, and insurer. This multivariate approach permits us to isolate the impact of factors affecting ambulatory surgery location decisions.

The MCDB is a unique all-payer physician claims database developed for health policy analyses by the Health Care Access and Cost Commission (HCACC). To complete this analysis we constructed several sets of variables as described below using the MCDB and supplemental data from the HSCRC:

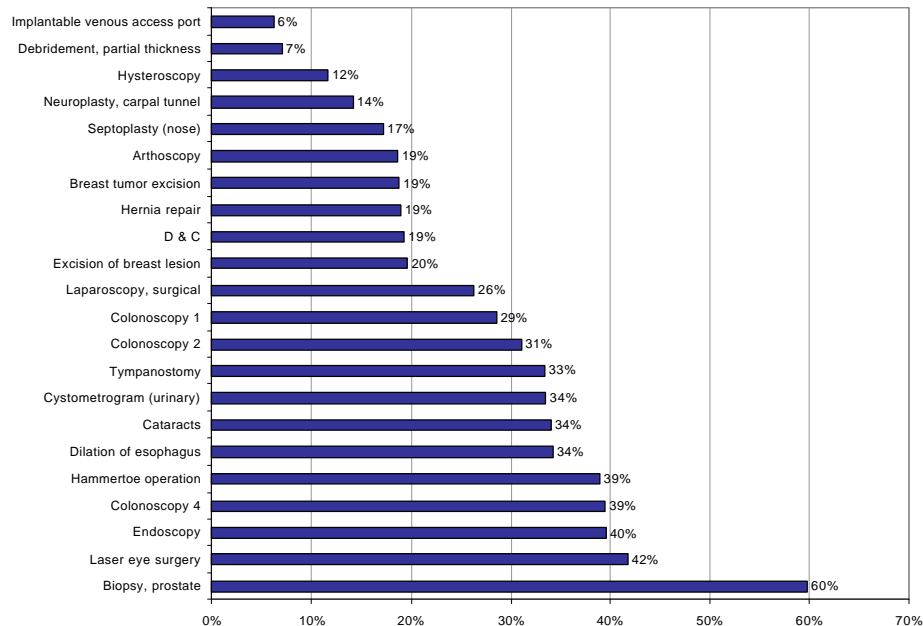
- ASC versus OPD surgery location: This variable was the dependent variable in all analyses and was constructed using data on the place of service and type of service data available from the MCDB.
- Case-mix of the patient: Using the diagnosis code recorded on the MCDB we generated case-mix variables using the Johns Hopkins University Ambulatory Care Group algorithm. We were also able to identify the patient's age and gender from the MCDB.
- Patient's payer: The MCDB provided a record on the patient's payer for a given surgery. We used three categories: private payer, Medicare and Medicaid.
- ASC procedure price: We estimated the ASC price for a given procedure based on the ASC allowed charges billed by the ASC on the same date of service as the surgery. We then used this price to compute average regional payer-specific prices for each procedure examined. We linked the appropriate average price to each patient based on the patient's payer, county of residence and the procedure performed.
- OPD procedure price: We obtained average OPD procedure charges from the HSCRC generated on a per-payer, per-region basis. These prices represent the regulated price of a given OPD surgical procedure. We linked these prices to a patient based on the patient's payer and county of residence and the procedure performed.
- Provider performing the procedure: Using the provider tax ID reported on the MCDB claims, we identified providers across all three payer groups. The provider characteristics component of our model is equivalent to incorporating a separate

explanatory variable for each surgical provider or group practice treating patients with a case-load of greater than 20.

We combined these variables to generate an analytic database that initially contained nearly 400,000 observations. Due to limitations in our pricing imputation algorithms we were required to reduce this sample to nearly 100,000 observations for our

Figure 1

Percent in ASC for High Volume ASC/OPD Procedures



analysis. The final database consisted of patient/procedure observations for Maryland residents receiving any of 22 possible surgeries representing the top 50th percentile of ambulatory procedures performed. Although not fully representative of all ambulatory surgery in Maryland, we believe our analysis presents the most conservative sample of procedures with which to examine the effect of price and insurance on ambulatory surgical treatment location choice.

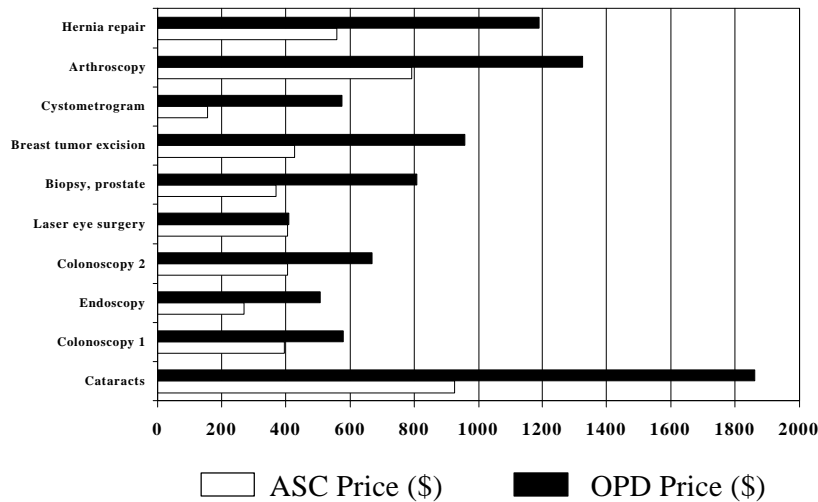
Results

The highlights of our empirical results are presented in several figures. In Figure 1, we show the range in the percent of ambulatory surgeries performed in an ASC setting for the 22 procedures of interest.

In Figure 2, we illustrate the relative differences between ASC and OPD prices for the highest volume procedures. ASC prices are considerably lower than OPD prices, with the exception of laser eye surgery. Some of these differences may be artifacts of our data imputations. However, these figures represent the most reliable price estimates available, given the data resources available.

Figure 2

Average Price Comparisons -- ASC v. OPD
High Volume Procedures



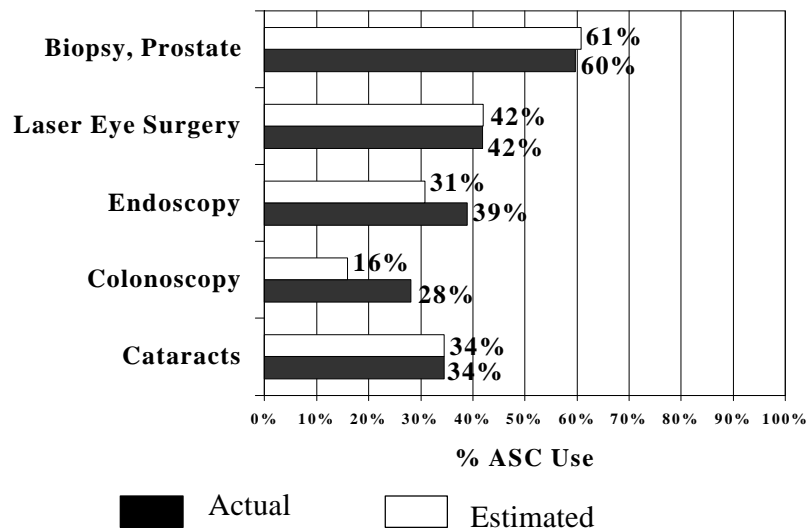
In Figure 3 we present the results of a simulation constructed from our multivariate statistical models where we assume that there is no price difference between ASC and OPD locations and estimate a predicted probability of ASC treatment location. These results show changes in the percent of procedures in an ASC for two of the five procedures examined. In the case of colonoscopy, the estimated results predict the share of ambulatory surgery to be reduced to 16 percent from 28 percent. This result may be explained by the clinical factors, such that a medical provider may prefer to perform the procedure in a hospital setting in case a more invasive procedure is required as a back-up medical treatment strategy.

We also find significant differences in payer-related ambulatory surgery location choices. Using Medicare as a reference, we find that ASC locations are less likely to be used when the patient's payer is a private insurer. This result counters anecdotal reports and conventional wisdom that private payers direct patients to ASCs. Although we have examined only a handful of the thousands of ambulatory procedures, the top five procedures examined account for 25 percent of all ambulatory surgery in the state of Maryland. When we examine the effects of payers for the 22 procedures in the top 50th percentile of ambulatory surgical volume we find private payers to be more associated with OPDs in general.

Finally, we found the choice between ASC and OPD to be strongly related to the individual surgeon or group practice providing the treatment. For all of our procedure-specific multivariate models, including the individual providers' characteristics as a variable, explain the greatest variation in location choice. Across procedures, the individual provider characteristics variable explained from 38 to 70 percent of variation in location choice. Due to limitations in the data we are unable to ascertain whether the variation is due to financial incentives facing a provider, such as ASC ownership, or simply a persistent practice style favoring treating in one location.

Figure 3

What if OPD Price = ASC Price?



Conclusions

In summary, we find that price, payer, and provider preferences for treatment have significant effects on the location for an individual patient's care. This result does not make any judgment as to the quality of the care received by the patient, only the likely market and professional forces at work.

With regard to future health policy formulation, we believe our findings show that legislation to liberalize OPD prices could have a significant impact on the site of care for procedures in which have no site preference, such as colonoscopies and to a lesser extent endoscopies. However, in situations where physicians have a marked site preference, such as cataract surgery, provider preferences are the key determinant of location and eliminating a price difference is less likely to change the pattern of site selection. Based on these results, we would suggest that any proposed deregulation in OPD prices be employed carefully. It should be noted that our analysis does not provide insight into the

cost implications of an ambulatory surgery price change, nor does it address the financial performance of ambulatory surgical providers.

We would also suggest that the variation in provider preferences for treatment locations be further examined to determine if there are any quality concerns that may be affected by liberalizing the prices within the OPD surgery market.

CHAPTER 1

STUDY OVERVIEW

The purpose of this report is to examine the variations in site of service for ambulatory surgery in Maryland. For this analysis, ambulatory surgery is defined as taking place in two locations: a freestanding ambulatory surgery center (ASC) or a hospital outpatient department (OPD). In Maryland, OPD surgery reimbursement to the hospital is regulated through the Health Services Cost Review Commission (HSCRC). This regulation makes Maryland unique from all other states where market conditions prevail. Unlike OPD reimbursement, ASC reimbursement in Maryland is unregulated, with prices determined largely by insurers contracting with freestanding facilities. Some of these freestanding facilities may be owned by a hospital, but they are still reimbursed outside of the regulated OPD surgery market because they are distinct from the hospital facility. Maryland is also somewhat unique in that prior exemptions from Certificate of Need (CON) regulations resulted in a high supply of freestanding ASCs, particularly small, single-specialty facilities.

Recent anecdotal evidence from medical providers and insurers (Washington Post, May 31, 1998) suggests that Maryland's regulated OPD surgery market has provided payers with the incentive to direct patients into ASC settings, where reimbursement rates are more favorable. The state's high supply of freestanding ASCs may have also contributed to this movement. There are also reports from providers that—when ambulatory surgery patients who live near Maryland's border need the inpatient back-up provided by the OPD setting—some managed care plans are directing these patients to outpatient facilities in jurisdictions outside of Maryland so that more favorable pricing can be negotiated with the facility.

In order to address the role of regulation and managed care in Maryland's ambulatory surgery market and to test the anecdotal evidence with actual data, we developed an empirical analysis to identify the effect of price and payer on patient-level ambulatory surgery location decisions. Our empirical analysis was guided by reviews of the health care finance literature on ambulatory surgery and by Medicare legislation and program rules for OPD and ASC reimbursement. We also completed an exploratory

analysis of the 1995 National Survey of Ambulatory Surgery (NSAS) to compare Maryland's experience with the nation. From this comparison we concluded that there may be significant payer-related variations in ASC utilization that should be addressed in the analysis of Maryland data. In addition, the prior literature suggested that the price of a freestanding ASC relative to a hospital OPD's price would be an important factor to model explicitly.

This report is organized around four subsequent chapters. In Chapter 2, we provide a literature review on the trends and economic analyses associated with ambulatory surgery. A summary of our NSAS analysis is presented in Chapter 3. In Chapter 4, we describe the methods and results of our multivariate analysis using the 1996 HCACC Medicare Care Data Base (MCDB). Finally, we summarize the empirical results and discuss their policy implications in Chapter 5.

CHAPTER 2

LITERATURE REVIEW

Evidence of the impact of financial incentives and regulations on ambulatory surgery elsewhere in the country has been documented in a limited number of empirical studies. In this chapter, we summarize the relevant literature regarding economic and other incentives affecting ambulatory surgery location decisions, and provide an overview of Medicare regulations and reimbursement policies for ambulatory surgery. The chapter concludes with a brief discussion of the implications of the literature review for our own subsequent empirical work.

2.1 Financial and Insurance Incentives

The industry-wide evolution emphasizing cost containment has fundamentally changed the U.S. health care system. The most visible trend has been the movement from fee-for-service provider arrangements toward a range of managed care strategies. In this atmosphere, outpatient care has emerged as a way to reduce inpatient costs by shifting certain procedures traditionally done on an inpatient basis to hospital or non-hospital outpatient settings.

There are three main decision-makers involved in the choice to have surgery and the site for that surgery: the insurer, the physician, and the patient. Insurers control the decision by their willingness to cover a procedure or surgery and the amount of coverage they provide. Insurers may also influence the site of the surgery through their coverage rules, including lower deductibles or coinsurance rates for procedures performed in an outpatient setting rather than an inpatient setting. In most cases, insurers may negotiate different rates at different sites of care and thus have an incentive to direct physicians or patients to use lower-cost sites. The physician plays the most important role in this decision-making process. He or she advises the patient on whether to undergo surgery and may also inform the patient of the different sites available for surgery. The physician may influence the patient's decision to have surgery and the patient's selection of the site

of care based on his advice or knowledge and sensitivity to the different financial incentives of the patient's insurance plan (Pauly and Erder, 1993). Physicians may also advocate one site over another based on a consideration of the patient's underlying health status, and they may have a direct incentive to guide patients to certain sites if they receive different payment levels based on the site of care or have a contract with an insurer that encourages them to have lower patient costs. Finally, the patient makes the decision to have the surgery and, to the extent possible given the input from and constraints defined by the physician and insurer, selects the site of care.

Often research has focused on the physician's role, assuming that it dominates the patient's decisions. However, patients may be influenced by their knowledge of different settings for surgery, the price they face for surgery (this is not the market price of the surgery, but rather their portion of it—coinsurance rate times the market price, or the deductible), opportunity costs, and other factors. For ambulatory surgery, patients may require greater assistance recovering at home (as compared to an inpatient surgery), and this may influence the patient's decision as to the site of care (Pauly and Erder, 1993).

The magnitude of savings for surgical procedures shifted to outpatient and ASC settings is unknown. Factors affecting whether a procedure is appropriate for an outpatient setting include the patient's general health condition, the duration and type of anesthesia required, and the recovery time for the procedure (Elnicki, 1976). One early study on the substitution of outpatient for inpatient care examined the cost savings if all one and two-day inpatient 1973 Florida Blue Cross stays were handled as outpatient care. The author found that if one-day hospitalizations were replaced by no more than four outpatient visits approximately \$1 million would be saved. However, these savings were a fraction of the \$175 million spent on inpatient care (Elnicki, 1976). These findings indicate that savings can be realized by shifting care from inpatient to outpatient locations, though these savings may be understated because the analysis was conducted before the explosion in inpatient costs.

Gold (1984) examined the substitution of outpatient for inpatient care by replicating earlier work by Davis and Russell (1972) using 1978 data. She evaluated which factors influence the demand for outpatient services, with particular attention to the

substitution between outpatient and physician or inpatient services. She found that the demand for outpatient services was highly responsive to the price for these services. A one percent decrease in the price of outpatient care resulted in nearly a one percent increase in the demand for outpatient care. In addition, there was a clear substitution effect between inpatient and outpatient care; as the price of inpatient care increased, the demand for outpatient care increased. If more specialists were available, the demand for outpatient services increased. Medicaid coverage had a positive effect on the demand for outpatient services, suggesting that an outpatient setting may substitute for physician offices for this population. If Medicaid reimbursement for physician care increased, the demand for outpatient care decreased. These findings suggest that outpatient services are used as a substitute for both inpatient services and for care provided in physician offices (Gold, 1984). In effect, the substitution of services can occur from the ‘top-down’ (i.e., inpatient to OPD) or from the “bottom-up” (i.e., physician office to OPD) with respect to the intensity and cost of the service.

Because insurers wish to reduce their inpatient costs, many have introduced monetary incentives to their enrollees to encourage the use of outpatient and ambulatory surgical settings rather than inpatient care for many services. These incentives may include lower (or no) coinsurance or deductibles. Pauly and Erder (1993) examined the impact of these incentives to see if they encourage the substitution of outpatient services for other sites of care and to evaluate whether these lower costs to patients encourage them to have surgery they might not otherwise have undergone. In their analysis, they used three models of consumer behavior: (1) the probability of having surgery; (2) the probability of having surgery in an ambulatory setting, given that the patient had surgery; and (3) the effect of surgical site on total surgical expenditures. They found that plan benefits were significantly related to the choice to have surgery; patients with more generous coverage were more likely to have surgery and those without generous coverage were less likely to have surgery. Generous insurance policies also increase expenditures on surgery. However, they found that policies that encourage the use of outpatient sites were not effective in encouraging the substitution of outpatient for inpatient surgery.

2.2 Medicare Ambulatory Surgery Policy and Reimbursement

Policy

Since 1982, Medicare has covered certain surgical procedures performed at ASCs. Medicare defines ASCs as freestanding facilities certified by Medicare to perform certain types of procedures on an outpatient basis (MedPAC, 1998). Though not necessarily physically separate from other facilities, Medicare-certified ASCs are independent in terms of licensure, accreditation, governance, professional supervision, administrative functions, clinical services, and accounting. This requirement allows HCFA to identify costs and charges associated with an ASC (FR 12 June 1998).

HCFA determines which procedures may be performed at an ASC based on safety, appropriateness, and effectiveness of performing the procedure in the ASC setting, reviewed and updated annually by the Secretary of Health and Human Services. These procedures generally require less than 90 minutes of operating time and four hours of recovery time. Procedures typically performed in a physician's office are excluded from the list (MedPAC, 1998).

Reimbursement

ASCs are paid on a fee schedule under Medicare Part B. As with other Part B covered services, ASC payment is subject to deductibles and coinsurance. Medicare pays participating ASCs 80 percent of the prospectively-determined facility rate, adjusted for regional variations in wages, with the beneficiary responsible for the remaining 20 percent. The payment rate covers the cost of services such as supplies, nursing services, and equipment, but excludes physician fees and other medical items and services that may be billed separately under other provisions of Medicare.

Currently, ASCs receive cost-based reimbursement at eight payment levels for the allowed list of Medicare surgeries. Each CPT on the ASC list is paid one of eight

prospectively-determined payment rates and is adjusted to reflect local area wages.¹ HCFA reviews and updates ASC payment amounts annually based on a survey of a random sample of participating ASCs. For 1998, rates ranged from \$314 to \$941 for the eight payment levels (MedPAC, 1998).

The rate to hospital OPDs providing ASC-approved services is a blended payment that is based on the lesser of a hospital's customary charges or reasonable costs and the corresponding ASC amount. This payment is typically less than the OPD's reported costs. The beneficiary cost-sharing amount is 20 percent of the hospital's charges rather than 20 percent of the corresponding ASC wage-adjusted amount. This stipulation means the beneficiary is generally responsible for a higher payment in an OPD because charges are usually higher than costs, though these charges are typically covered by supplemental insurance (MedPAC, 1998).

When multiple procedures are performed at an ASC, Medicare pays 80 percent of the wage-adjusted rate for the highest cost procedure. For all lower cost procedures, Medicare pays 50 percent of the wage-adjusted rate.

2.3 Implications for Empirical Analysis

The evidence from the literature suggests a number of factors that may be important determinants of where surgery is performed. While most of these studies focused on choices between the hospital inpatient setting and ambulatory settings defined in the aggregate (i.e., both OPDs and ASCs together), the findings may also be relevant for choices between ambulatory settings (i.e., OPD *versus* ASC). Factors that seem likely to play a role in determining the site of surgery include the relative OPD/ASC price faced by insurers, provider incentives and preferences, patient preferences and characteristics (including the type of insurer and underlying health status), and OPD/ASC differences in the expenditures required of the patient when a particular setting is selected over the other (likely to be especially relevant for Medicare and privately-insured patients).

¹ HCFA has proposed a different approach to grouping procedures for payment (FR 12 June 1998).

In the empirical work that follows, we include variables to reflect as many of these factors as possible; data limitations prevent us, however, from modeling all factors explicitly. For instance, we do not have information on whether a given provider has an ownership stake in a freestanding ASC (providing access to and incentives to use that facility).² Likewise, we have no data on patient preferences for a given site, nor on the relative prices *faced by patients* when selecting between sites (since this would require detailed information on their health insurance plan and a comparison of their year-to-date expenditures with their deductible amount).

² As explained in Chapter 4, although we cannot include a variable to reflect physician ownership of ASCs specifically, our empirical work does control for the total impact of the provider's preferences and incentives and other physician characteristics by using a physician-specific fixed-effects model.

CHAPTER 3

COMPARISON OF MARYLAND WITH THE NATION

3.1 Overview of Data

To assess the uniqueness of the Maryland ambulatory surgery market, we sought to compare Maryland's experience with national estimates of ambulatory surgery use by site of care (OPD v. ASC). National data were obtained from the 1995 National Survey of Ambulatory Surgery (NSAS) conducted by the National Center for Health Statistics. The NSAS uses medical record review to collect information on surgical and non-surgical procedures performed on an ambulatory basis in a national sample of hospitals and freestanding ASCs. For each sampled visit within these facilities, coders record the characteristics of the patient (age, sex, race/ethnicity), diagnoses and procedures, expected sources of payment, date of service, and patient disposition. The NSAS will support generation of estimates at the national and regional levels, but it is not possible derive estimates for particular states. We were, thus, forced to use a different source of data for Maryland.

Data on ambulatory surgeries performed in Maryland were derived from HCACC's 1996 Medical Care Data Base (MCDB). This file contains physician claims for Maryland patients who are covered by Medicare, Medicaid, or any of the private insurers in the state who are required to submit data for the MCDB. Critical data elements for the comparisons with the national data include the procedures and the place of service.

Comparisons based on survey data for the U.S. and claims data for Maryland will not be perfect due to inherent differences between the databases in the type of facilities included, the populations covered, the way the 'place of service' and 'payer' variables are identified, and—most importantly—the way procedures are coded. For example, the MCDB includes some claims for inpatient services, while the NSAS excludes certain types of outpatient and freestanding facilities from the sampling frame. Similarly, the MCDB represents only the Medicare, Medicaid, and privately-insured populations, whereas the NSAS includes patients with other types of coverage as well as the uninsured. A critical

analysis variable—the place of service—is defined unequivocally on the NSAS by knowing the type of facility surveyed, whereas coding of place of service on the MCDB claims can vary across payers, sometimes erratically. Conversely, on the MCDB we know payers with a high degree of accuracy since it is defined by the claims stream, while payer data on the NSAS is the expected rather than the actual payer. And, finally, defining comparable sets of procedures from the two files is difficult because the NSAS uses the ICD-9 coding system and the MCDB uses CPT-4 procedure codes. As described in the next section, we attempted to account for these types of differences so that we could come as close to an ‘apples’ to ‘apples’ comparison as possible.

3.2 Database Construction

We began the task of database construction by using the NSAS data to identify specific surgical procedures that were: (1) performed with a relatively high volume and/or (2) performed disproportionately in one of the two settings of interest (ASC v. OPD). Procedures were grouped into categories defined by the two-digit level of ICD-9 codes. Appendix A shows the relative frequencies and the percent of the procedures in each procedure category nationally that were performed in a freestanding ASC. An ‘H’ next to a procedure indicates that it was performed with relatively high frequency in an ASC, while an ‘L’ indicates a low ASC frequency. Not surprisingly, eye operations were frequently performed in ASCs, while laparoscopic cholecystectomies and cardiac catheterizations were typically performed in hospital OPDs.

In order to compare site of service for a given surgical procedure in Maryland and the nation, we needed to identify comparable sets of procedures in the two files. This step required mapping the ICD-9 procedure codes used in the NSAS to the CPT-4 procedure codes used in the MCDB. We used the ICD-9/CPT-4 crosswalk developed by MedicodeTM, but often found instances where the mappings were not one-to-one due to the nature of the coding systems. Typically, the ICD-9 codes mapped to a larger set of CPT-4 services than just the procedure under investigation, such as claims for follow-up visits and screening tests. We decided that the most conservative way to proceed was to

compare aggregated procedure definitions. For example, as opposed to examining particular types of cataract surgery, we focused on all lens operations as a group.

The location of ambulatory surgery in Maryland was identified using the self-designated place of service variable on the claims data. We found this field to be most reliable for Medicare claims and less reliable for private insurance claims. Finally, in order to ensure more appropriate comparisons, we removed from the NSAS file all records where the payer was not Medicare, Medicaid, or private, and we excluded procedures from the MCDB that were performed on an inpatient basis.

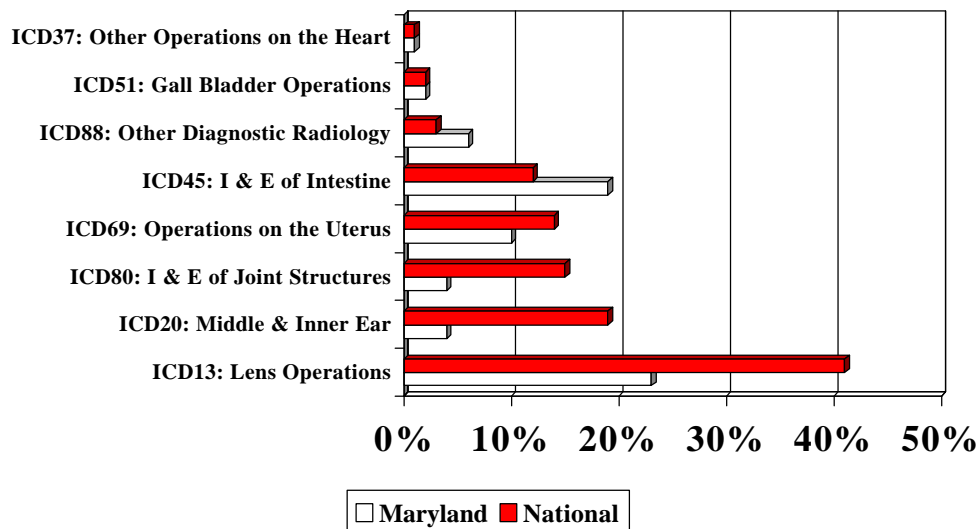
3.3 Results

Using the linked NSAS and MCDB data we were able to compare the ASC and OPD utilization rates in Maryland and nationally for specific categories of surgical procedures. In Figure 3-1 we show the Maryland and national percentage of ambulatory surgery completed in an ASC for selected outpatient procedures. These procedures were chosen for analysis either because they were high-volume procedures (lens operations [cataracts], incision/excision of the intestine [endoscopies], incision/excision of joint structures [arthroscopies], operations on the uterus [D and Cs], and other operations on the middle and inner ear [myringotomies]) or because they were shown by the national data to be performed predominantly in hospital OPDs (operations on the gall bladder [laparoscopic cholecystectomies], other operations on the heart [cardiac catheterizations], and other diagnostic radiology [angiocardiography]) or in freestanding ASCs (lens operations).

With only two exceptions for the procedures examined, Maryland appears to be below the national average in terms of the proportion of procedures performed in an ASC setting. For laparoscopic cholecystectomies and cardiac catheterizations, the Maryland experience mirrors the national data with very few procedures performed in an ASC.

Figure 3-1

**Percent of Top-Volume Outpatient Procedures
Performed at Freestanding ASCs**



For the third study procedure that is typically done in a hospital OPD, angiocardiology, Maryland's percent in an ASC is actually higher than the national average, but the difference is small in absolute terms (6 percent v. 3 percent). Maryland also exceeds the national average for the proportion of endoscopies performed in an ASC (approximately 18 percent v. 12 percent).

For the remaining study procedures—D and Cs, arthroscopies, myringotomies, and lens operations—the proportion of procedures performed in an ASC appears to be lower in Maryland than nationally, and some of these differences are dramatic. These findings run counter to expectations generated by Maryland's relatively high supply of freestanding ASCs and the higher regulated prices in the OPD market.

In addition to the analysis presented in Table 3-1, we also conducted a similar analysis by payer to examine whether, within a given payer category, Maryland differed from the nation in the proportion of the procedures performed in an ASC. Results of that

analysis, which were presented to HCACC at the October 1998 monthly meeting, are shown in Appendix B. In general, the data do indicate that there are differences by payer class and suggest that it will be important to consider this variable in subsequent empirical work.

In light of the caveats noted earlier regarding comparisons using the disparate survey and claims databases, the findings from these comparative analyses must be considered illustrative only. Of particular concern are inconsistencies that may remain in defining comparable sets of procedures due to difficulties mapping ICD-9 and CPT-4 procedure codes. We are also somewhat suspicious of the place of service coding reflected on the MCDB since this variable relies on the accuracy of the medical support personnel who submit the claims. When a freestanding ASC is associated with a hospital, for instance, these coders may mistakenly indicate that the place of service was a hospital OPD rather than an ASC. In the next chapter, we conduct a much more detailed investigation of the Maryland ambulatory surgery market using the MCDB.

CHAPTER 4

ANALYSIS OF MARYLAND DATA

4.1 Data Overview

We used the 1996 Maryland Medical Care Data Base (MCDB), supplemented by several secondary data files, to develop a patient-level analysis of the factors affecting ASC versus OPD use. The MCDB is a unique all-payer physician claims database developed for health policy analyses by HCACC. The conceptual basis for this approach was the perspective of practicing physicians who will choose where to perform a procedure based on their own preferences and financial incentives (both from third party payers as well as medical business partners), and on the patient's physiological condition, demographic characteristics, and insurer. This multivariate approach permits us to isolate the impact of the factors affecting ambulatory surgery location decisions.

We combined these data to generate an analytic database that initially contained nearly 400,000 observations. Due to data limitations, we reduced this sample to nearly 100,000 observations for our analysis. The final database consisted of patient/procedure observations for Maryland residents receiving any of 22 possible surgeries representing the top 50th percentile of ambulatory procedures performed in the state. Although not fully representative of all ambulatory surgery in Maryland, we believe our analysis presents the most conservative sample of procedures with which to examine the effect of price, insurance, and other factors on ambulatory surgical treatment location choice. Details of our methods and results are described below.

4.1.1 Data Sources and Variable Definition

This analysis used four data sources: 1) the Maryland Medical Care Data Base for 1996; 2) the HSCRC Outpatient Charge Summary File for 1996 services; 3) the 1997 Medicare Ambulatory Surgical Center Base Eligibility Public Use File; and 4) the

Medicode™ ICD-9 surgical procedure code to CPT-4 procedure code crosswalk. The following sets of variables were created from these data files:

- ASC versus OPD surgery location: This variable was the dependent variable in all analyses and was constructed using data on the place of service and type of service data available from the MCDB.
- Case-mix of the patient: Using the diagnosis code recorded on the MCDB we generated case-mix variables using the Johns Hopkins University Ambulatory Care Group algorithm. We were also able to identify the patient's age and gender from the MCDB.
- Patient's payer: The MCDB provided a record on the patient's payer for a given surgery. We used three categories: private payer, Medicare and Medicaid.
- ASC procedure price: We estimated the ASC price for a given procedure based on the ASC allowed charges billed by the ASC on the same date of service as the surgery. We then used this price to compute average regional payer-specific prices for each procedure examined. We linked the appropriate average price to each patient based on the patient's payer, county of residence, and the procedure performed.
- OPD procedure price: We obtained average OPD procedure charges from the HSCRC generated on a per-payer, per-region basis. These prices represent the regulated price of a given OPD surgical procedure. We linked these prices to a patient based on the patient's payer and county of residence.
- Provider performing the procedure: Using the provider tax ID reported on the MCDB claims, we identified unique providers across all three payer groups. The provider characteristics component of our model is equivalent to incorporating a separate explanatory variable for each surgical provider or group practice treating patients with a case-load of greater than 20.

4.1.2 Analytical File Construction Summary

The analytic file construction proceeded in five steps. The first three steps concentrated on developing ASC and OPD prices. The fourth step was to incorporate person-specific case-mix variables. The final steps created all remaining regional, payer and provider variables on a person/procedure unit of analysis. Details of each step are provided:

- **Step 1: Construction of ASC price files and identification of the surgical procedures (CPTs) population.**

In this step, we used MCDB data to construct ASC prices. We used the following inclusion criteria for CPTs that will be used in our study.

- All the CPTs were within the range of 10040 and 69999.
- Eliminate procedure reimbursement through secondary insurance coverage
- For Medicare, we used type of service (TOS=7) and service place (svcplace=3) to identify ASC facility charges. For Medicaid, presence of local codes W9011 to W9018 is used to identify ASC charge. For private, we used type of service (TOS=7), and specialty codes (90 or 91) to identify facility charges.

Once the facility charge records were identified, the ASC prices for each procedures (CPT) were determined by the average charges of the facility components.

- **Step 2: Calculation of prices for outpatient surgical procedures.**

This information is obtained from an outpatient average charge file provided by HSCRC. The HSCRC file is a ICD/payer/county level file. To facilitate price comparison, we first converted the HSCRC file to a CPT/payer/county level file using the crosswalk provided by MedicodeTM. In addition, we also converted the outpatient prices to a CPT/region/payer level by aggregating the records by CPT codes, region codes and payer type code.

Files generated in steps 1 and 2 are merged together as a price file. Meanwhile, only the CPTs that exist in both files (e.g., ASC price file and outpatient price file) are kept in the study.

- **Step 3: Imputation for missing prices**

Some CPTs may have prices at state level; but not at region/payer level because those surgeries were not performed on patients in certain regions/payer groups. We imputed values for these missing data by using the average prices of ASC payment group within the region/payer.

- **Step 4: Construction of case-mix variables.**

To account for different types of medical conditions present for a given patient we generated a set of thirty-two case-mix variables. These case-mix variables represent Ambulatory Diagnostic Groups (ADGs), which is a by-product of the Johns Hopkins University Ambulatory Care GroupsTM (ACGs) case-mix algorithm (Weiner et al., 1991). ACGs have been applied to the all of the populations (Medicare, Medicaid and private insurance) in earlier published analyses and were an effective tool for this analysis.

Identifying each surgical patient's unique combination of ICD-9 diagnosis codes generated the ADGs. The diagnosis codes were mapped using the ACG software into one of 32 ADG categories from the MCDB. A complete list of the possible ADGs is available from the authors upon request or can be obtained from Weiner et al., 1991.

- **Step 5: Construction of person/date/CPT level ASC/OPD surgical procedure files.**

Before constructing the analytical files, some adjustments were made to avoid the possible double counting and mis-identification of patient:

- Re-construction of person ID variable
- The original ID variable in the MCDB file is an encrypted subscriber ID. We concatenate the original ID variable with gender and date of birth to generate an encrypted person ID.
- Adjustment for adjunction (negative adjustment)
- All the records that were entered for adjustment purposes (usually with negative values) were deleted.
- Elimination of secondary insurance coverage records.

With the prices and the CPT population determined in Steps 1 - 3, we constructed the final analytical file by scanning through the MCDB file from this step and keeping all the claims with the CPTs identified in step 1 and then merging with the ADG file created in Step 4.

The final analytical file is a person/date/CPT level file. As a result, a person receiving two surgical procedures on the same day would have two separate records in the file. The file also retains from the MCDB file some demographic characteristics of the patient, including gender, age, treating provider (from Provider Tax ID) and the county of patient residence. The dependent variable of our analysis, choice of site of service, is also included in the analytical file: ASC =1 if the procedure performed in an ASC setting, and ASC=0, if performed in a hospital OPD setting.

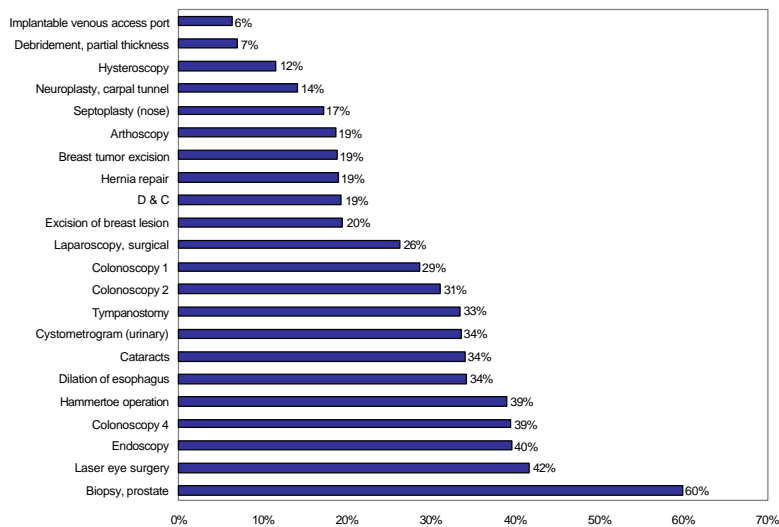
4.2 Price and Location Differences for High-Volume Ambulatory Surgeries in Maryland

In Figure 4-1, we show the range in the percent of ambulatory surgeries performed in an ASC setting (rather than in a hospital OPD setting) for the 22 procedures

of interest. These percentages range from a low of only 6 percent for implanting a venous access port (94 percent of these procedures are performed in an OPD) to a high of 60 percent for prostate biopsies.

Figure 4-1

Percent in ASC for High Volume ASC/OPD Procedures



In Figure 4-2, we illustrate the relative differences between ASC and OPD prices in Maryland for the highest volume procedures. ASC prices are considerably lower than OPD prices, with the exception of laser eye surgery. Some of these differences may be artifacts of our data imputations. However, these figures represent the most reliable price estimates available, given the data resources available.

4.3 Determinants of Ambulatory Surgery Location

Using the analytic file described in section 4.1 , we completed a multivariate statistical analysis to identify the determinants of ambulatory surgery location. We

modeled the choice of ambulatory surgery location between an ASC and OPD as a function of patient age, gender, and case-mix; the percent change in ASC prices relative to OPD prices; payer; and provider characteristics. A multivariate statistical model provides a analytic tool for isolating the independent effects of the price difference between ASC and OPD services as well as the patient's payer on the decision to use an ASC rather than an OPD.

Figure 4-2

Average Price Comparisons -- ASC v. OPD
High Volume Procedures

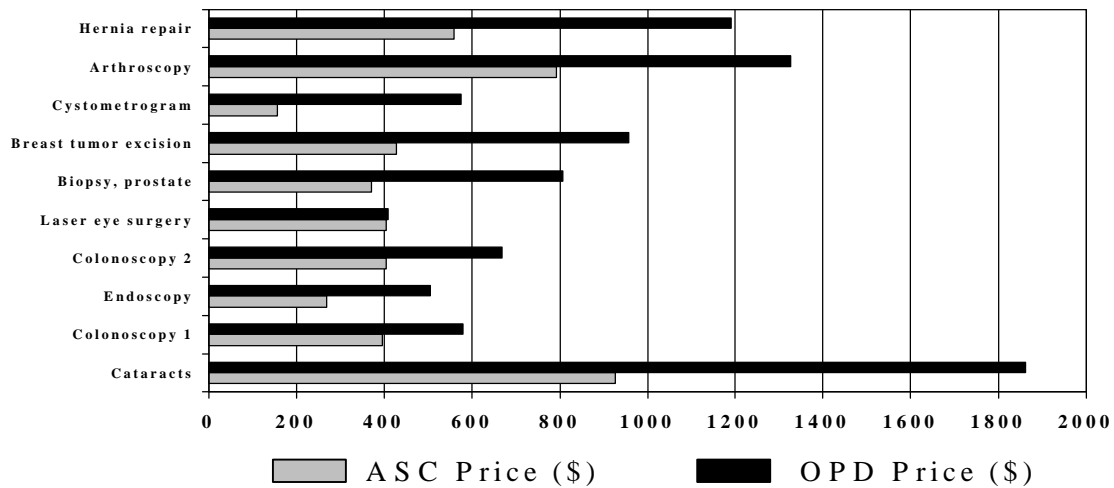


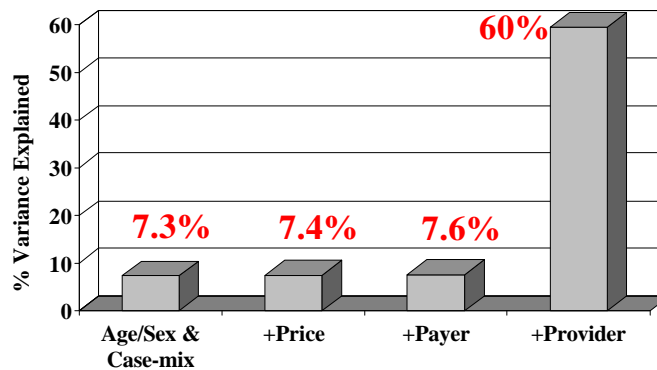
Figure 4-3 demonstrates how well our general model predicts treatment location for all 22 procedures using the set of explanatory variables described earlier. Each bar in the figure represents the proportion of variation in ambulatory surgery location choices that a given specification of the statistical model explains. A value of 100 percent is most desirable (and generally unobtainable in health services research) since it would indicate that we have perfectly predicted the choice of treatment location using the variables at our disposal. From Figure 4-3 we see that a model that seeks to explain surgical location as a function of the patient's age, gender, and case-mix explains only 7.3 percent of the variance in location choices. Adding price and payer to the model has very little effect on the overall explanatory power. Adding the fixed-effect term to capture the influence of

provider characteristics, on the other hand, improves the statistical fit of the model dramatically—increasing the proportion of the variance explained from 7.6 to 60 percent.

The provider variable represents a variety of physician-specific factors that may affect treatment location, including ownership of an ASC, physician practice style, provider education, hospital affiliation, and group practice affiliation. We can not ascribe the predictive power of our results or their interpretation to any one of these factors without more information to identify a specific impact. However, by including this variable we find that provider characteristics taken as a whole account for a large amount of the variation in treatment location, and are an important factor to account for when identifying the impact of payer or price on the treatment location decision.

Figure 4-3

Power of Models to Explain ASC v. OPD Location



Cumulative Multivariate Statistical Model Components

It is important to note that although the provider variables explain a large amount of the variation in surgery location choice, they may not have as large a marginal impact on location site choice as other variables of interest to us, such as age, payer and price. The marginal impact of these and other variables on location choice (derived from the

coefficients of the model) are the key results for a policy analysis, once a model with an acceptable level of overall explanatory power has been developed.

Table 4-1 presents the marginal impact of each of the key explanatory variables on the treatment location decision—at the patient level—of the five highest volume ambulatory surgeries. For all variables other than the price variable, the coefficients reported in Table 4-1 represent the *percentage point* change in the probability of using the ASC associated with that variable. For the price variable, the number presented represents the *percent* change in the ASC probability in response to a percent change in the price of an ASC relative to an OPD.

In the interest of brevity, we do not include the 32 case-mix variables' marginal effects, nor those of the up to 195 provider-specific control variables (the number of providers varies by procedure). However, we describe the results of the provider effects separately in our discussion of Figure 4-4. Appendix C provides a listing of all of the regression results used to generate this table. At the bottom of Table 4-1 are the R-squared statistics associated with cumulative effect of adding a new component to the statistical model, in a fashion similar to that described in Figure 4-3.

Although patient age was not an important contributor to the overall fit of the model (as seen in Figure 4-3), the marginal effect of age on treatment location is substantial. In the case of prostate biopsy, males aged 35 to 44 have a 45 percentage point higher probability of being treated in an ASC when compared to men who are 65 and older. Interestingly, all patients below the age of 65 are a little less than 10 percent less likely to receive an endoscopy in ASC. Colonoscopies are also less likely to be performed in an ASC for patients under the age of 65. Patient gender generally did not have a significant effect on ambulatory surgery location.

With respect to payer differences, we find that patients with Medicaid or private coverage often tend to have a lower probability of having their procedure performed in an ASC when compared to Medicare patients. In the case of endoscopy, the probability of an ASC location is about 20 percent lower for both Medicaid and private insurance patients. The one exception among the five procedures is for cataract surgery, where private

insurance patients are more likely to be receiving procedures in an ASC setting than are Medicare patients.

Table 4.1

Likelihood of having Procedure Performed in an ASC rather than an OPD

Independent Variable	<i>Biopsy, Prostate</i>	<i>Laser Eye Surgery</i>	<i>Endoscopy</i>	<i>Colonoscopy</i>	<i>Cataracts</i>
Age: (reference: 65+ years)					
Age 19 to 34	-34.6%	-42.1%	-8.9%	-1.9%	-21.7%
Age 35 to 44	45.0%	-8.6%	-7.3%	-7.3%	-8.5%
Age 45 to 54	-11.5%	5.5%	-8.2%	-9.7%	-9.1%
Age 55 to 64	1.9%	-7.0%	-7.1%	-9.1%	-6.1%
Gender: (reference: female)	N/A	0.0%	1.9%	-0.1%	-0.04%
Case-mix: 32 categorical variables not shown for presentation brevity					
Supply Price Elasticity: % Change in Pr(ASC location)/ % Change in ASC Price	0.001	0.85	0.35	1.50	-0.007
Payer: (reference: Medicare)					
Medicaid	0.0%	0.0%	-22.1%	4.3%	0.0%
Private Insurance	-30.6%	-9.8%	-21.7%	-5.7%	6.9%
Dependent Variable Mean (% in ASC)	59.8%	41.9%	39.1%	28.2%	34.1%
Intercept	13.7%	34.3%	12.6%	-11.1%	-18.3%
Number of Observations	2,564	6,681	11,525	12,560	24,637

Items in **bold** indicate the independent variable's effect was significant at the 0.5 level.

Explanatory Power (adjusted R- square) of Different Statistical Models

#1) Age, gender, case-mix	16.4%	2.6%	5.1%	7.9%	3.1%
#2) Model #1 + Price	16.9%	2.5%	5.1%	8.5%	3.1%
#3) Model #2 + Payer	22.9%	2.8%	5.2%	9.0%	3.1%
#4) Model #3 + Provider	71.9%	72.9%	65.3%	47.1%	68.8%

Table 4-1 also shows the effect of price on treatment location decisions. We present the price effects as an output price elasticity. Elasticity is a term used in health economics to describe the percent change in the quantity of goods supplied or demanded relative to a percent change in price. If we consider a decision to treat in an ASC to be an expression of the production of ASC services, we can use our multivariate regression to estimate how a given percent change in the price reimbursed to providers leads to a percent change in ASC services provided.

Using this elasticity framework, a positive change in the amount an ASC service is reimbursed would result in a higher probability that laser eye surgery, endoscopies, and colonoscopies would be performed in that setting. The larger the value reported, the greater the sensitivity of the location decision with respect to relative prices. As a result, colonoscopies would be fairly sensitive to price, with a 1 percent increase in price yielding a 1.5 percent higher likelihood of using the ASC setting. Despite the fact that ASC price is only half the price of OPD services, price had no effect on location decisions for cataract surgery and prostate biopsy.

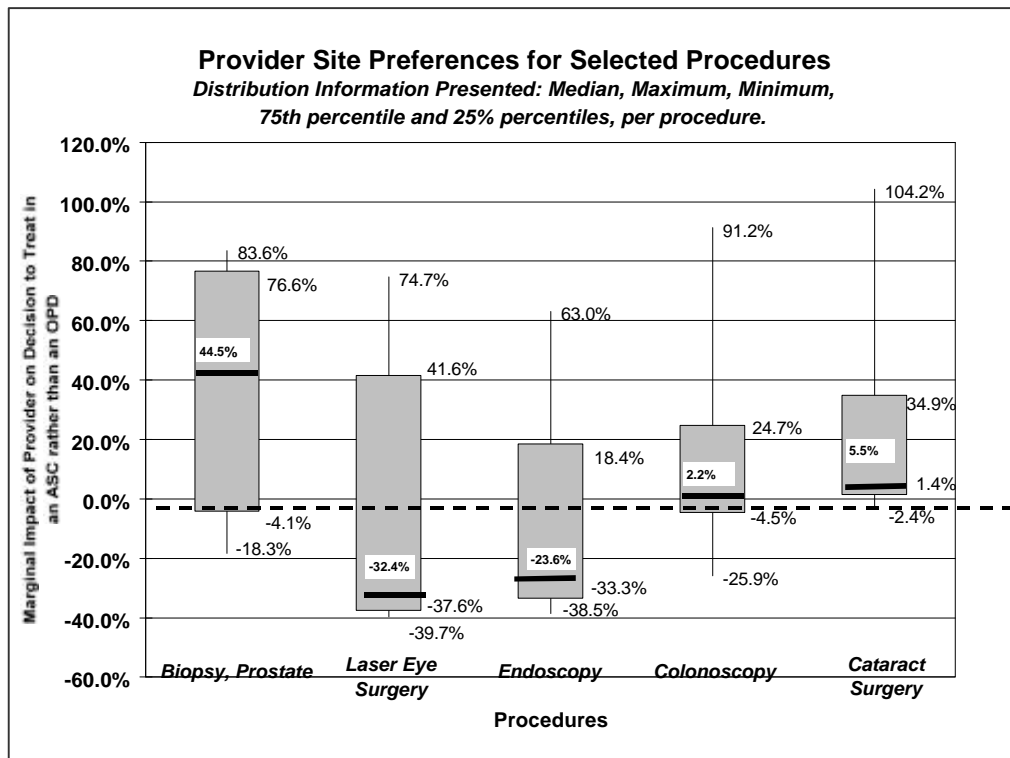
It is important to note from the last section of Table 4-1 that, for some procedures, the age/gender/case-mix model did a better job of explaining the variation in treatment location than the average results shown in Figure 4-3, while for other procedures this basic model accounted for even less than the 7.3 percent of the variance explained than we found for all 22 procedures combined. In the case of prostate biopsy, for example, nearly 17 percent of the variance was already explained by the basic model in comparison to less than 3 percent of the variance explained for laser eye surgery. In all cases, though, we see a dramatic improvement of the fit of the model once we account for provider effects.

4.4 Impact of Provider Location Preference on Ambulatory Surgery Location

In Figure 4-4 we present the distribution of each provider's individual effect on the probability of treatment in an ASC rather than OPD location. We refer to these effects as 'provider preferences' because they correspond to a provider's propensity to treat or not treat in an ASC setting for a series of unmeasured but important reasons. Figure 4-4

displays the median, maximum, minimum, and 75th and 25th percentiles of the distribution for the five high volume procedures examined in Table 4-1. The highest point of the ‘whiskers’ for each distribution is the highest individual provider’s marginal effect on the probability of selecting an ASC location. In the case of prostate biopsies this value would be 83.6 percentage points, indicating that this provider was 83.6 percentage points more likely than the average provider to perform prostate biopsies in an ASC. The lowest point of the whisker corresponds with the provider who has the lowest propensity to seek an ASC. For prostate procedures, this value would be –18.3 percentage points. The top and bottom of the gray bar are associated with the 75th and

Figure 4-4



25th percentiles, respectively. The range within the bar represents the middle 50th percentile range of the providers and their preferences to treat in an ASC. The thick line in the middle of the bar represents median provider; that is the provider who is exactly in the middle of the distribution. A marginal impact of 0.0 percent indicates that the provider

is essentially indifferent between treatment sites. Being positioned above the 0.0 line indicates a preference for the ASC setting, while a position below the 0.0 line shows a preference for OPDs.

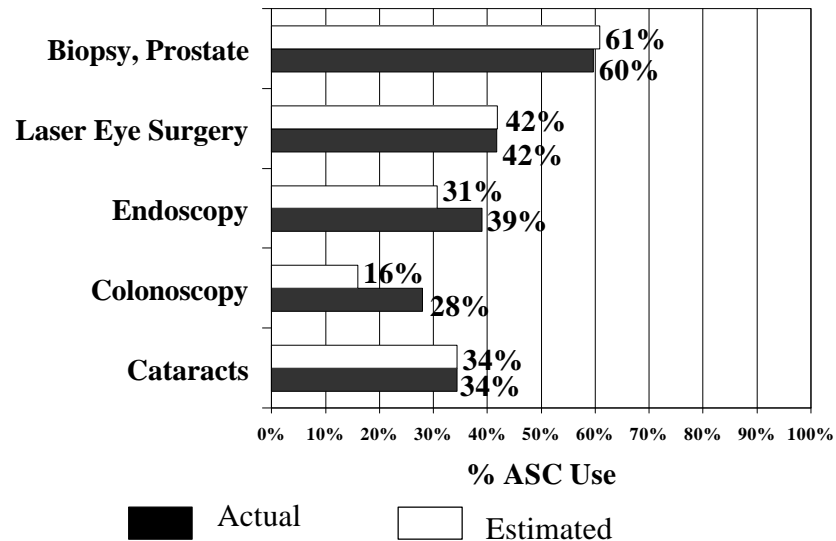
We offer Figure 4-4 to demonstrate the range in provider treatment location preferences. These ranges describe a group of providers' propensity to treat in an ASC setting, *after accounting for the impact of patient case-mix, age, gender, price differences and payer effects*. For example, almost without exception, providers prefer to provide cataract surgery in an ASC setting. On the other hand, well over 50 percent of the providers performing endoscopies or laser eye surgery prefer to perform these procedures in an OPD setting. These results demonstrate a large variance in preferences given the procedure examined.

4.5 Equalizing ASC and OPD Price Simulation Results

In Figure 4-5 we present the results of a simulation constructed from our multivariate statistical models. In this simulation, we assume that there is no price difference between ASC and OPD locations and estimate a predicted probability of ASC treatment location. By setting up the simulation in this manner, we are effectively equalizing the prices of OPDs and ASCs to determine the extent of any difference between current ASC use (given the current pricing structure) and projected ASC use (under a structure of equal prices). These results, presented in Figure 4-5, show little change in the percent of procedures in an ASC, with the exception of colonoscopy where the share of procedures performed in an ASC would drop from 28 percent to 16 percent. The colonoscopy results may be explained by the clinical factors related to the use of the procedure. For this procedure, a medical provider may prefer to perform the procedure in a hospital setting in case a more invasive procedure is required as a back-up medical treatment strategy. As a result, we can conclude that price has little effect on the use of a procedure even though the absolute difference in the prices is quite substantial.

Figure 4-5

What if OPD Price = ASC Price?



If we interpret the simulation results with respect to the provider location preference findings, we observe price equalization having less (or no effect) for the procedures where the majority of providers favor one location over the other. For example, in the case of cataract surgery, the majority of providers would prefer to treat in ASC setting, all else being equal, and the impact of price equalization from our simulation is nonexistent. Contrast this result to colonoscopy or endoscopy where the majority of providers appear to be indifferent on location choice. In this case, price equalization has much greater impact. Therefore, we find price equalization is most likely to have an impact for procedures where providers are “indifferent” about location.

CHAPTER 5

CONCLUSIONS

5.1 Summary of Maryland Empirical Findings

In summary, we find that price, payer, and provider preferences for treatment have statistically significant effects on the location for individual patient care. This result does not make any judgment as to the quality of the care received by the patient, only the likely market and professional forces at work. Based on our empirical analysis we have three principal findings:

- **Provider preferences are a key determinant of location choice.** Provider preference, that is a practitioner's predilection to always choose an ASC or OPD location, explains the variation in the ASC v. OPD decision far more than any other variable. For the top 22 procedures considered as a group it explains just over 50 percent of the variation in site selection. Among the 5 procedures examined individually its explanatory value ranged from 38 to 70 percent. The pattern of provider preference differed among these procedures, as shown in the distributions of the provider site preference. For laser surgery, the majority of treating physicians demonstrated a consistent preference for choosing an OPD location, while for cataract surgery, the vast majority of physicians prefer to treat patients in an ASC setting. These results may simply reflect other potential causes: ownership in or lack of access to an ASC facility and clinical necessity. However, without additional information we are unable to determine the precise cause of the provider's preference or to identify whether the extent of variation has an impact on the clinical effectiveness and economic efficiency of a procedure.
- **Price differences between ASCs and OPDs can influence location choice.** Price differences explain only a small portion of the existing variation in site location. However, changes in OPD price relative to ASC price can alter the location decision for some procedures, as demonstrated in the simulations that set OPD price at the ASC level. The predicted location for colonoscopies shows a dramatic shift in site. When providers appear to have no site preference, price changes are more likely to impact ASC use, as in the case of endoscopy or colonoscopy. Conversely, when we observe no price effect, the net effect of

physician site preference would explain location, as it does in the case of cataract surgery where provider preferences are the key determinant. In those situations where physicians have a marked site preference, eliminating a price difference is less likely to change the pattern of site selection.

- **For most high-volume procedures, private payers have a negative effect on ASC use.** Contrary to conventional wisdom, private insurers do not necessarily favor ASCs. When Medicare was the reference insurer, the marginal impact of being privately insured ranged from –30 percent to 6.9 percent. Only in the case of cataract surgery, a procedure dominated by Medicare, was private insurance associated with an increased probability that a patient would have a surgery completed in an ASC. Also, independent of the differences in their allowed charges for procedures, payers explain a small but statistically significant share of the variation in site selection, on average explaining about 0.3 percent of the variation.

5.2 Policy Implications

With regard to future health policy formulation, we believe our findings show that legislation to liberalize OPD prices would likely have a significant impact on the providers of care. Allowing hospitals greater flexibility in setting OPD prices seems likely to create shifts in location for procedures in which physicians do not have a significant preference for one site over another. We would expect these location shifts to occur only where procedures are price sensitive such as colonoscopy, endoscopy and laser eye surgery. But for procedures associated with a strong physician preference for a particular site such as prostate biopsy and cataract surgery, price liberalization is likely to have little effect on the location decision.

It should be noted that our analysis does not provide insight into the cost implications of an ambulatory surgery price change, nor does it address the financial incentives of physicians treating patient in an ASC and OPD setting. To complete such an analysis would require significantly more complete information at the encounter level from hospitals on outpatient services and cost report information from ASCs and OPDs to identify their cost to provide services. Even with this information, it may be difficult to

develop an accurate estimate of what a change in policy would do because of the imprecision in procedure level coding between ASC and OPD services as we found when matching ICD-9 and CPT-4 coding systems to generate our Maryland price estimates. Furthermore, the lack of direct accounting for these procedures' resource use within a facility's cost structure imposes a significant barrier to a more complete analysis.

The finding that private payers can negatively affect the choice of an ASC location runs counter to anecdotal evidence that managed care plans are directing patients into ASCs. We find that the payer with the highest probability of ASC use is Medicare which, through its fee-for-service reimbursement system, exerts practically no influence on treatment decision other than through price.

While payers do influence the location of surgeries they have less of a role than do physicians, as our provider preference analysis suggests. However, since we are only able to report that providers have strong preferences without understanding what influences those preferences, we do not think that it is appropriate to suggest a policy impact of this finding. Nevertheless, the extent of the variation in site preferences may be an important area of discussion with provider groups who wish to examine the reasons why there are such pronounced effects and whether there are any quality of care issues to be considered as a result.

CHAPTER 6

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